



THE FUTURE IS NOT WHAT IT USED TO BE

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Chair BCHP Initiative

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Mississippi Valley Gas Company

June 3-6, 2001

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THE PROBLEM:

*1-Energy shortages could nag the U.S. economy for a number of years

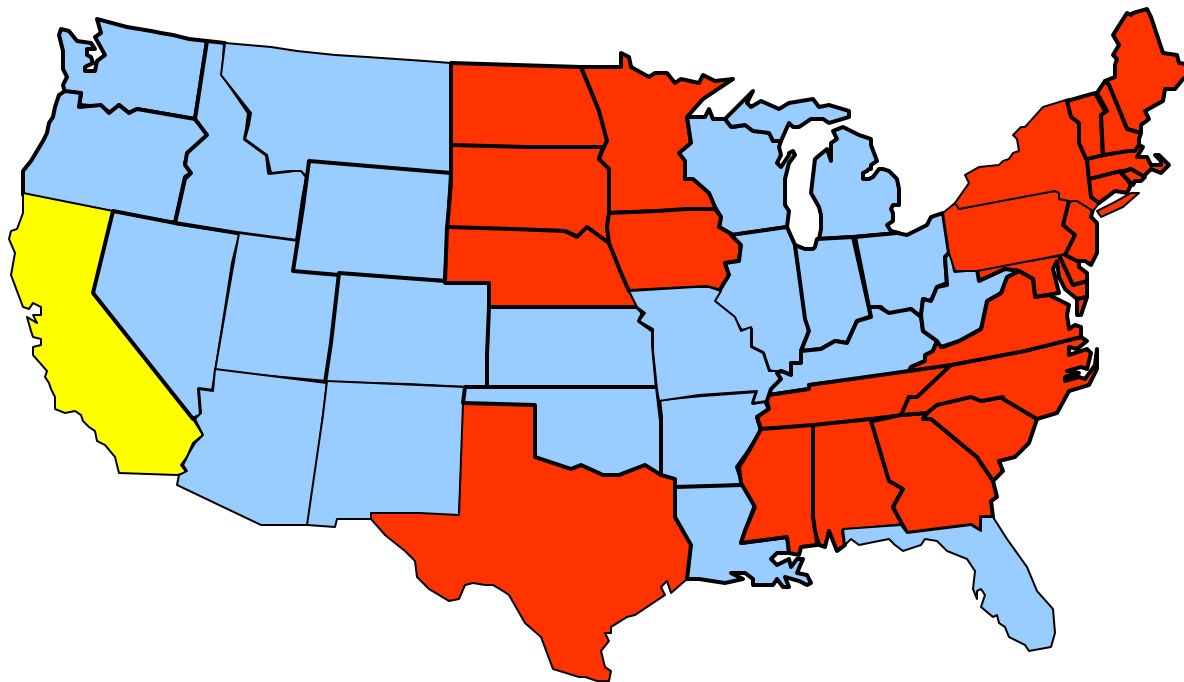
Alan Greenspan

Chairman Federal Reserve

- Price of all energy increasing
- More frequent brown outs
- Problem with power quality



■ Areas with Capacity Margins < 10 percent





THE PROBLEM

*2 The U.S. with only 2% of the world's population produces 25% of the greenhouse gases.

- World condemns Bush as he pulls out of global warming treaty
- Air pollution threatens The Great Smoky Mountains National Park. Also the parks in Alaska, Texas, New York, Arizona, Florida and Wyoming

National Parks Conservation Association

- Added cost to clean power plant emissions
- Deaths each year attributed to pollution: 50,000 to 100,000



A sample of greenhouse gases affected by human activities

	CO ₂	CH ₄	N ₂ O	CFC-11	HCFC-22	CF ₄
Pre-industrial concentration	-280ppmv	-700ppbv	-275ppbv	zero	zero	zero
Concentration in 1994	358 ppmv	1720 ppbv	312ppbv	268pptv	110pptv	72pptv
Rate of concentration change	1.5 ppmv/yr	10ppbv/yr	0.8ppbv/yr	Opptv/yr	5 pptv/yr	1.2pptv/yr
Atmospheric lifetime (years)	50-200	12	120	50	12	50,000

Source: IPCC, 1995_a



THE PROBLEM

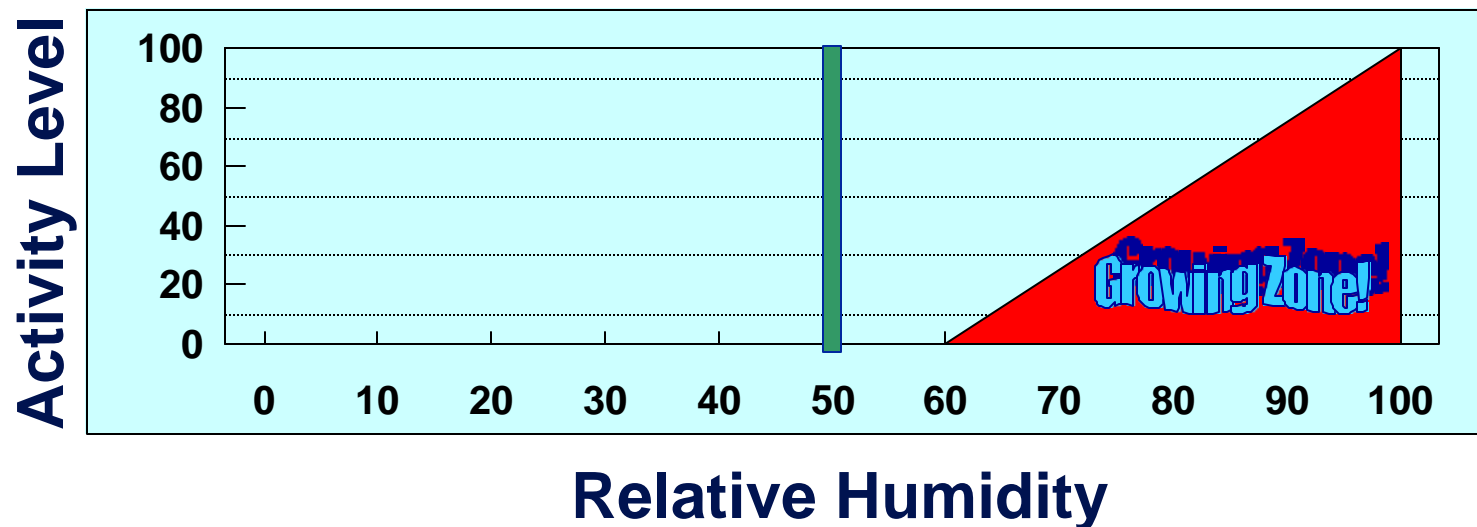
*3 Indoor Air Quality is getting worse.

- Asthma cases have increased 50%
- Sinusitis is also on the increase. Cost to U.S. estimated to be over \$6 billion per year
- Air conditioning ducts are a great place to grow mold and bacteria
- “Fred” the dust mite, is alive and well and has lots of friends



Optimum Relative Humidity for Minimizing Adverse Health Effects

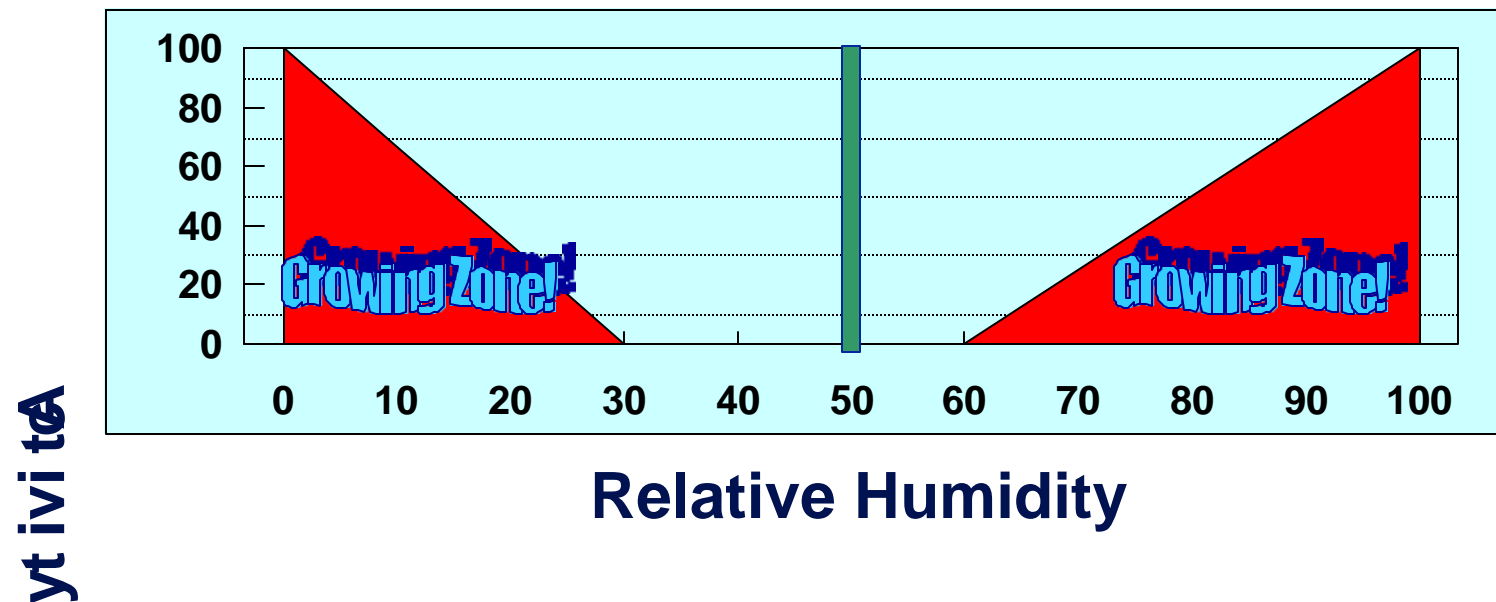
Mold & Mildew





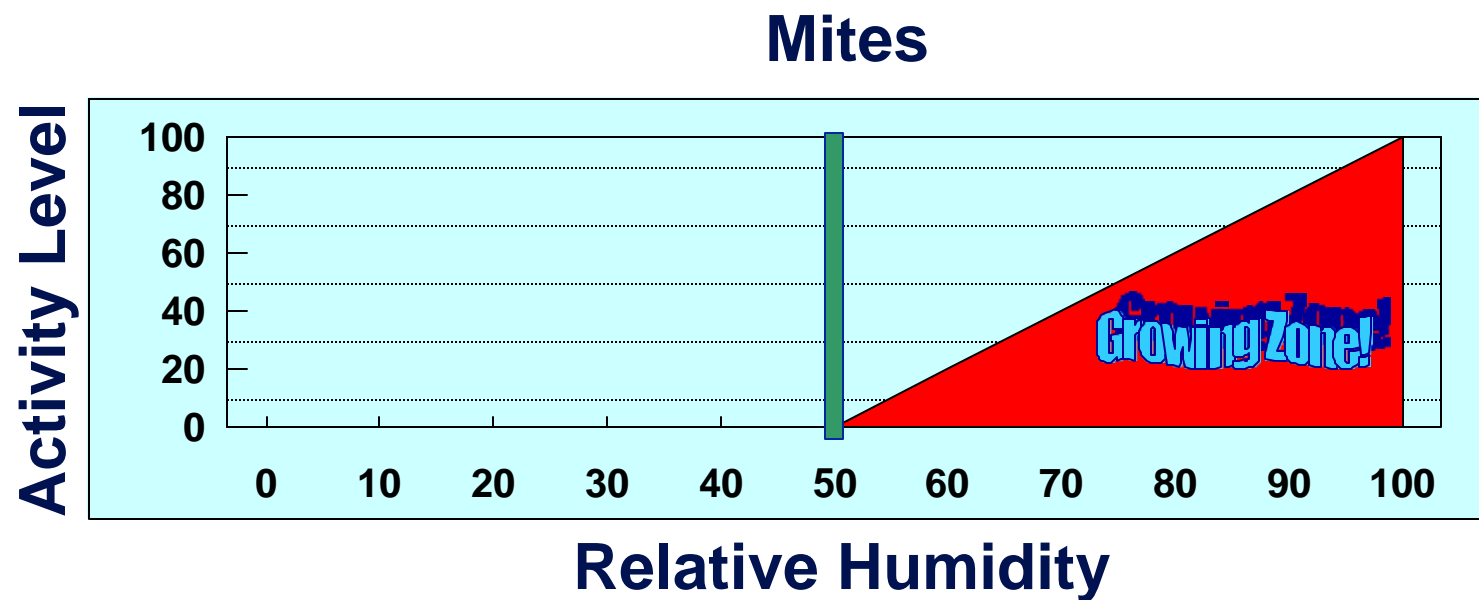
Optimum Relative Humidity for Minimizing Adverse Health Effects

Bacteria





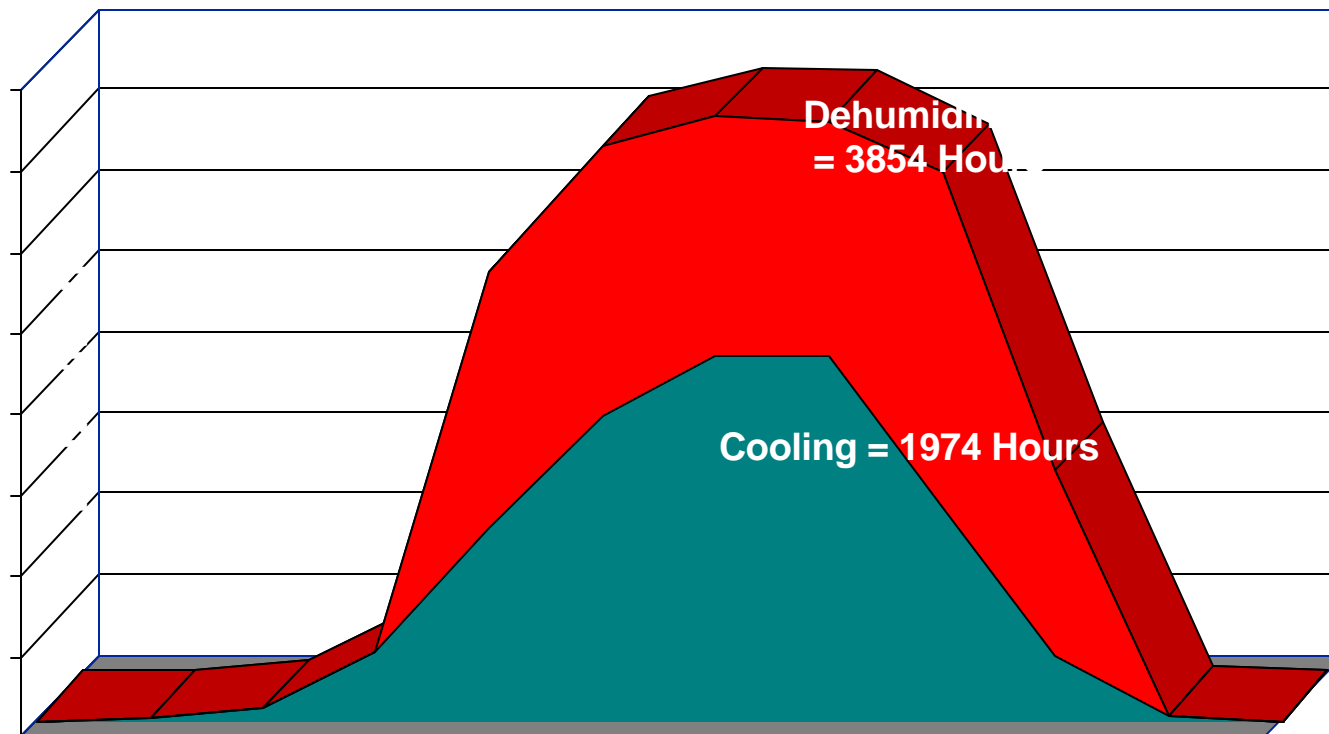
Optimum Relative Humidity for Minimizing Adverse Health Effects





Annual Ventilation AC Hours - Atlanta, GA

Space Conditions:
75° F, 50% RH

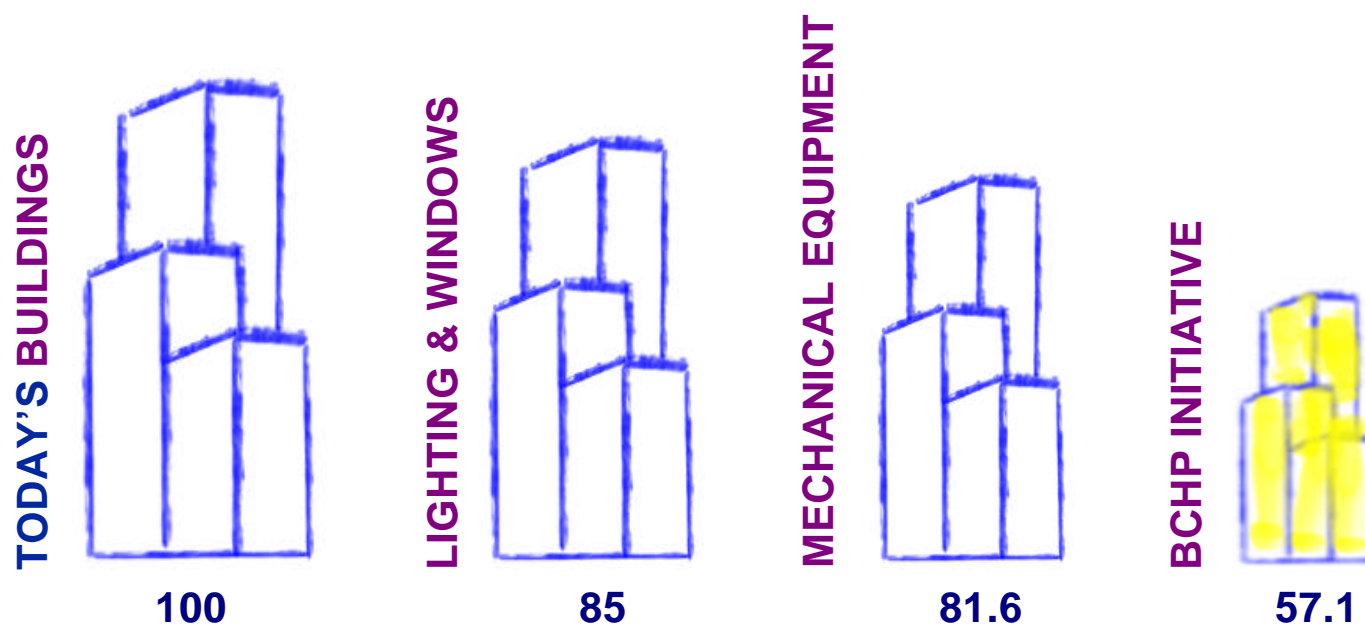




Efficiency

Benefits of the DER Approach

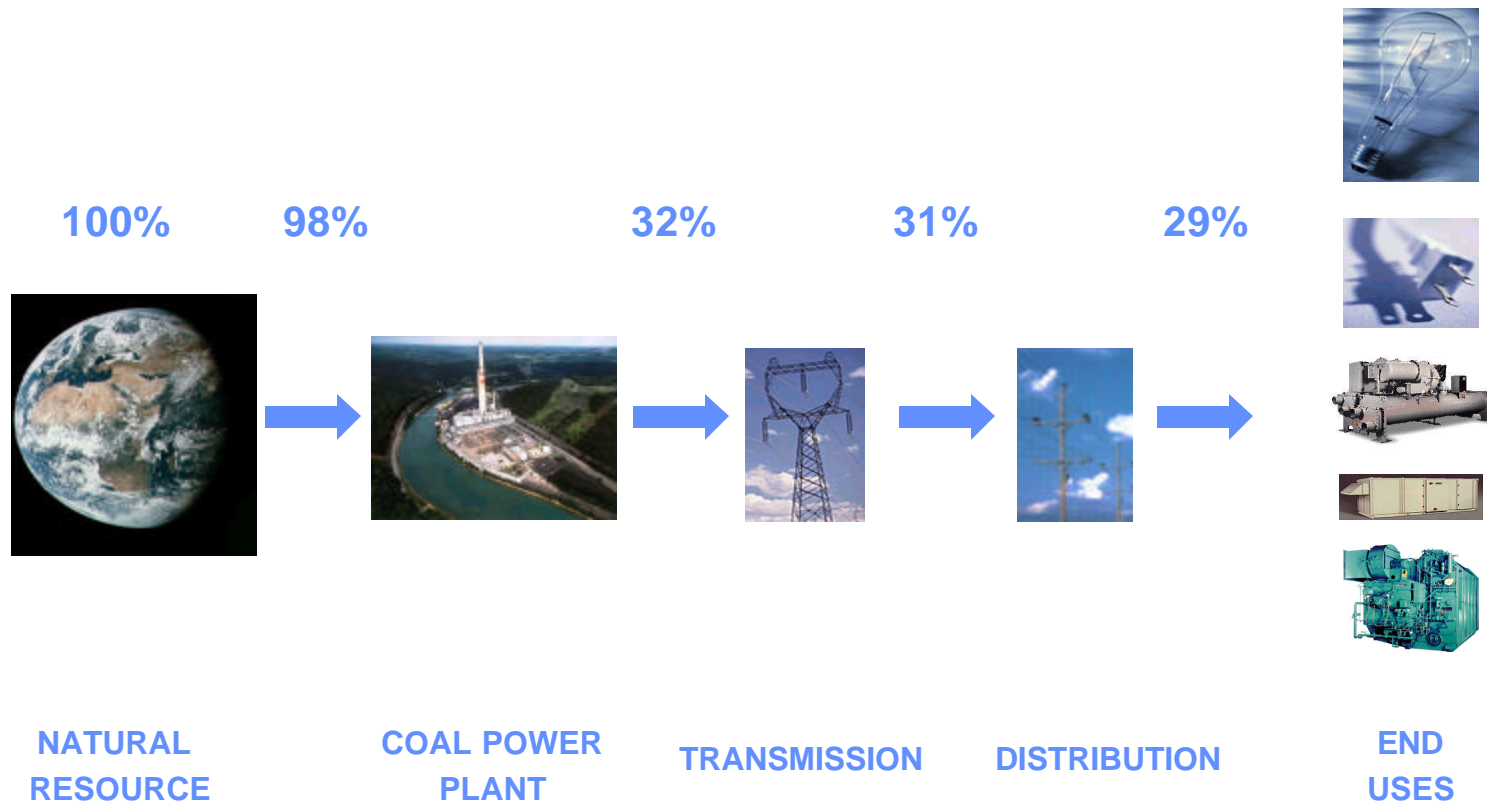
30% Natural Resource Savings



% ENERGY USE vs STATUS QUO

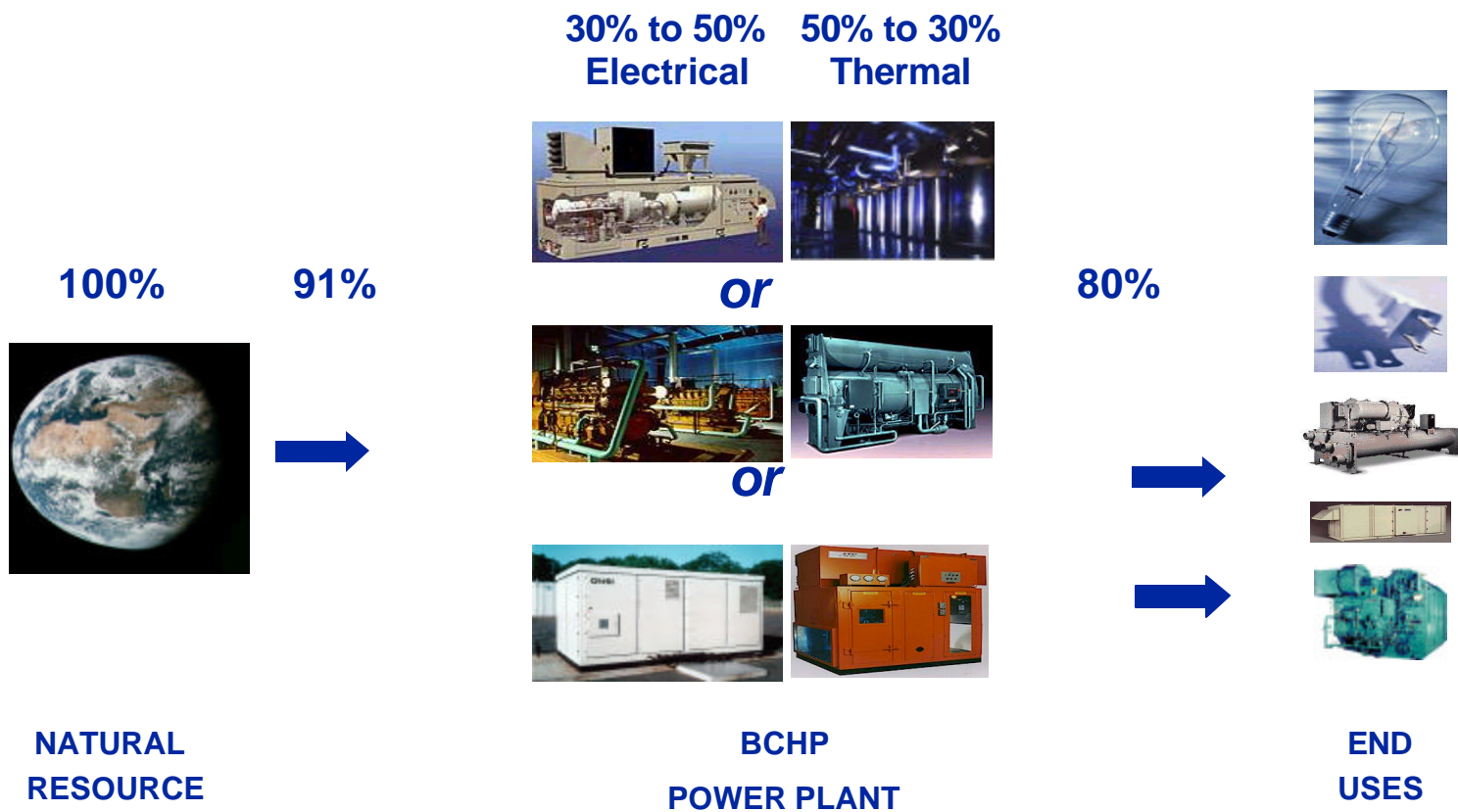


Efficiency of Central Power Generation





Delivered Efficiency of BCHP





- o “Advice is what we ask for when we already know the answer but wish we didn’t.”



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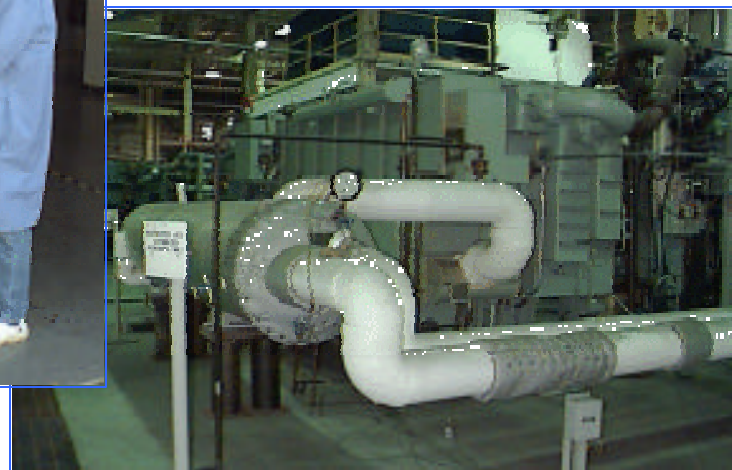
OUR GOAL

***Make nation's energy generation
delivery system the cleanest and
most efficient, reliable and
affordable in the world.***



DOE OFFICE OF DISTRIBUTED ENERGY RESOURCES

Technology Under Development To Serve 2002 - 2010 Market Needs



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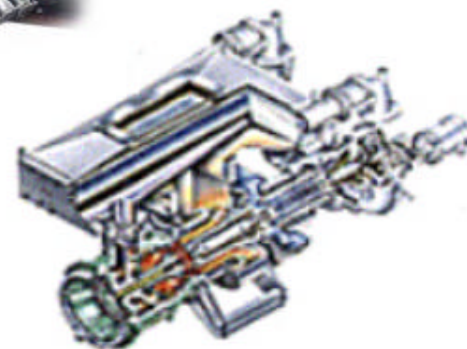
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Next Generation Gas Turbine

Vision

**2000: First generation
advanced gas turbine
@ 4,500 kW**

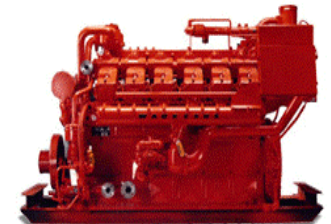
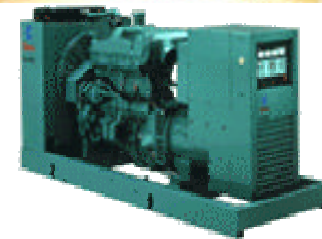


**2010: Broad product lines of cost
reduced advanced gas turbines**



Distributed Energy Resources Engine Vision

**2000: Natural gas engines
30% efficient and moderate
NOx emissions**



**2010: Advanced reciprocating
engine system “ARES” ~ 50%
efficient & 5ppm NOx emissions**

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Microturbine Vision

**2000: First generation
microturbines ~ 22-25 %
efficient & \$1,000 / kW**



**2010: Advanced microturbines ~
35% efficient equipment (LHV)
& \$500 / kW equipment price**



Fuel Cell Vision

**2000: First generation
fuel cells \$3,500 / kW & low
temperature recoverable energy**



**2010: Advanced fuel cells ~
\$1,000 / kW equipment price &
high temperature recoverable energy**



LiBr Absorption Chiller Vision

**2000: Good technologies,
but limited penetration**



**2010: Broad market penetration through
25% cost reduction 30% more efficiency
and integration with BCHP systems**



Desiccant Dehumidifier Vision

**2000: Niche market
equipment for high value
humidity control applications**

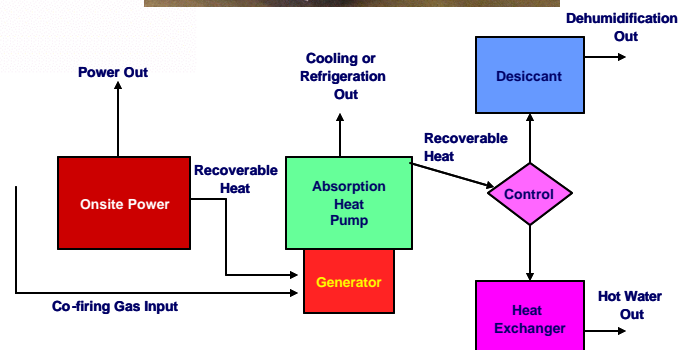
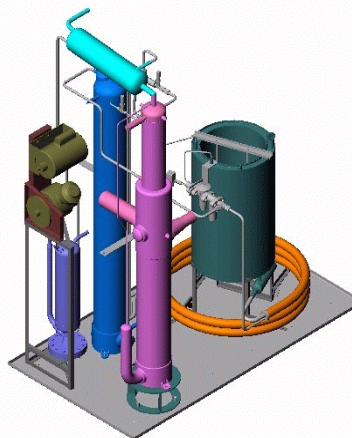


**2010: Mainstream humidity control using new
solid desiccant materials & new liquid
technologies resulting in 50% cost reductions**



Ammonia/Water Absorption Technology Vision

**2000: Advanced GAX
technology entering
field trials**

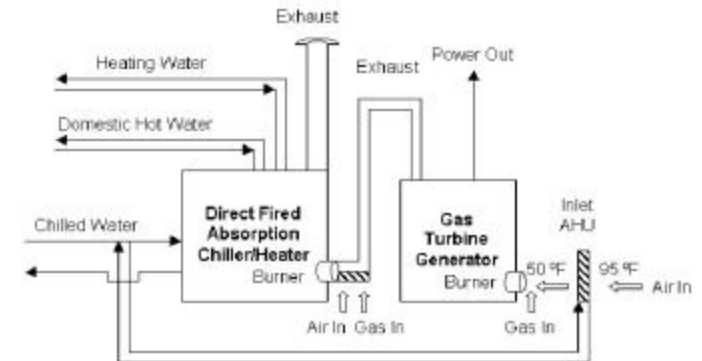


**2010: Absorption - based chillers, heat
pumps and BCHP systems adopted by
large segments of customers**



BCHP Vision Packaged System Integration

**2000: Individually
optimized products**

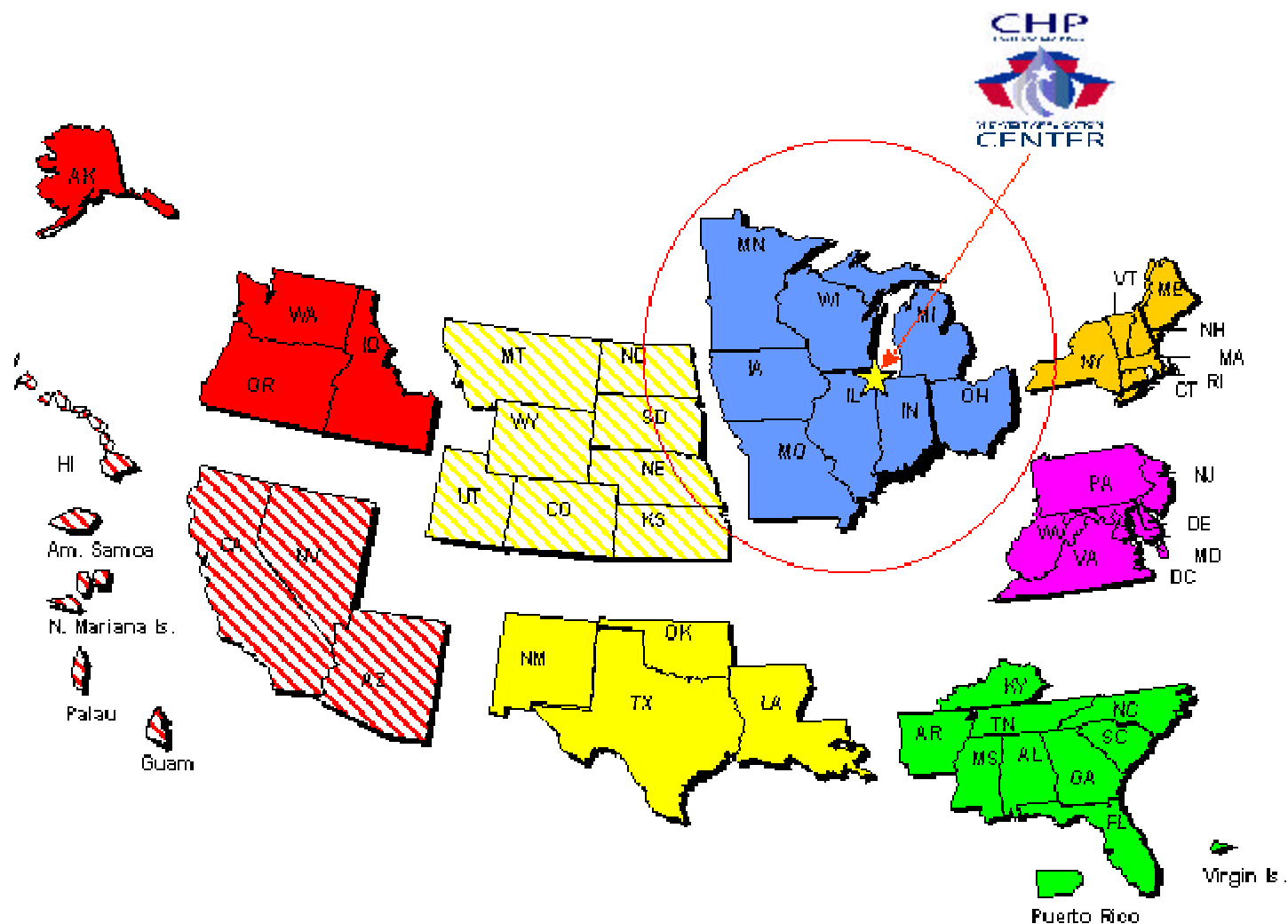


**2010: BCHP
optimized systems**





Regional Application Centers



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REGIONAL APPLICATION CENTER APPROACH

MISSION:

**DEVELOP TECHNOLOGY APPLICATION KNOWLEDGE AND
THE EDUCATIONAL INFRASTRUCTURE NECESSARY TO:**

- **Reduce Any Perceived Risks**
- **Foster CHP as a Viable Option**
 - * **Technical and Financial**
 - * **Energy and Environmental**

FOCUS:

- **Education**
- **Information**
- **Project Assistance**



MIDWEST REGIONAL APPLICATION

PARTNERSHIP BETWEEN:

- University of Illinois at Chicago
Energy Resources Center---UIC/ERC**
- Gas Technology Institute---GTI**

SPONSORSHIP:

- DOE Office of Power Technologies**
- Office of Distributed Energy Resources**

PROGRAM SUPPORT

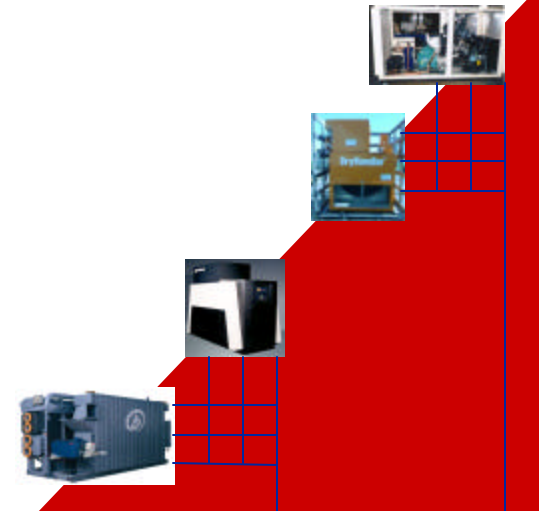
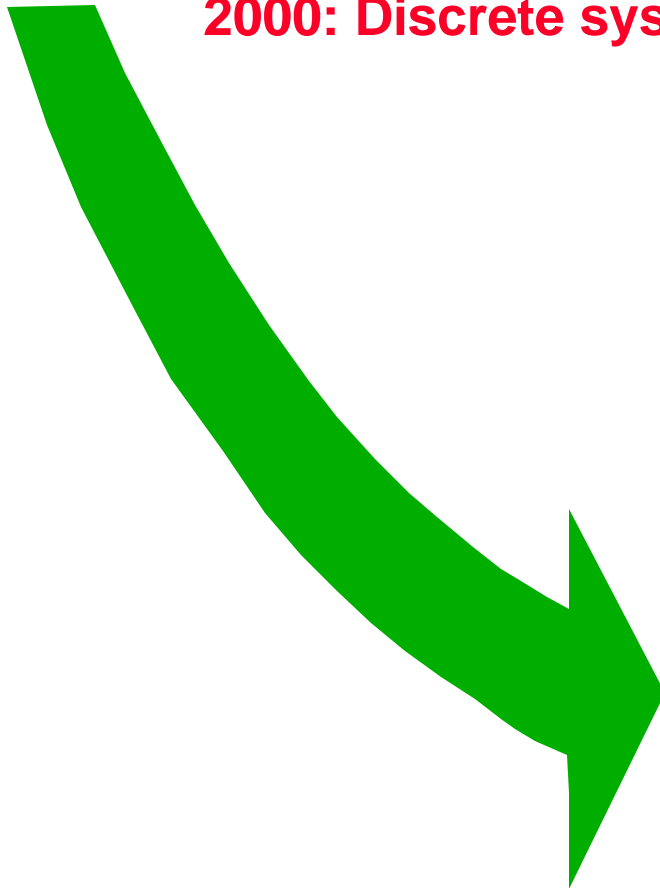
- Oak Ridge National Laboratory---ORNL**



CHP Integration Test Building

UNIVERSITY OF MARYLAND

2000: Discrete systems



2010: Efficient building
integrated systems

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BCHP BENEFITS TO SOCIETY

America can benefit from BCHP because:

- 30% or better improvement in primary energy efficiency
- 45% or better reduction in CO₂ emissions
- Improved IAQ through the increased use of desiccant dehumidification
- Economic benefits through improved GRID reliability (I.e. reduced peak time blackouts)
- BCHP is a classic case where government catalyst is essential as individual companies could not succeed.



Action Plans

- WEBSITE promotion and BCHP information distribution: BCHP.org
- 3-year strategic plan development
- Expand partnering opportunities
- Design Assessment Tools Creation
- Encourage Packaged Systems Development (U of M Test Building)
- Establish Regional Application Centers
- Outreach education programs for architect, engineering and building owner/operator education



o WHEN YOU COME TO A
FORK IN THE ROAD,
TAKE IT!

o

Yogi Berra